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BACTERIAL GILL DISEASE OF FRESH-WATER FISHES

By
S.F. Snieszko[1/]
Bacteriologist
Branch of Fishery Research
Bureau of Sport Fisheries and Wildlife

INTRODUCTION

Gill diseases in salmonid fishes are characterized by swelling, clubbing or fusing of gill filaments and lamellae. They are attributed to bacterial infections or malnutrition. Bacterial gill diseases cannot, so far, be reproduced experimentally.

IDENTIFICATION

Sudden lack of appetite. Fish head against the current. Gill filaments and lamellae swollen or fused. Thin, long gram-negative bacteria present on the gill surfaces. Microscopic examination of gills gives most certain diagnosis. Methods of isolation of pathogens not adequately developed for diagnostic purposes.

CAUSE OF THE DISEASE

Bacteria have not been adequately described. Most likely aquatic myxobacteria related to those causing columnaris disease.

SOURCE AND RESERVOIR OF INFECTION

Not established. Most likely fish with chronic infections and contaminated water supply. Mud and silt in water.

MODE OF TRANSMISSION

Unknown.

INCUBATION PERIOD

Appears to be 3-7 days.

PERIOD OF COMMUNICABILITY

Unknown; very likely as long as any infected fish are in the water supply.

SUSCEPTIBILITY AND RESISTANCE

Seems to be most common among the hatchery raised fry and fingerlings of salmonid fishes.

RANGE

Very common under all conditions among hatchery raised fingerling trout and salmon.

OCCURRENCE

Known only in the hatchery raised salmonid fishes.

1/ Headquarters: Eastern Fish Disease Lab., Leetown (P.O. Kearneyville) West Virginia.

METHODS OF CONTROL

A. Preventive measures.

a. Water supply should be free from fish, silt and mud. The supply of water should be adequate enough to prevent detectable accumulation of products of fish metabolism, ammonia in particular.

b. Weekly or biweekly treatments with Roccal (10% commercial solution 1:50,000) 20 p.p.m.; pyridylmercuric acetate technical and Lignasan X at 2 p.p.m. or even 1 p.p.m. Treatment should last up to 1 hour. The last two chemicals are particularly toxic to rainbow trout.

B. Treatment.

The same chemicals as for prevention. Roccal must be used for 3 consecutive days. The other two have to be used repeatedly for 2 or 3 days in acute and advanced cases of gill disease.

ANNOTATED BIBLIOGRAPHY

In this bibliography are listed the most important papers in English language on the nature, treatment and prevention of gill disease.

* Allison, Leonard N.
1957. Variation in strength of pyridylmercuric acetate technical and its effect on rainbow trout. Prog. Fish-Cult., Vol. 19, No. 3, pp. 108-111.
Different batches of PMA may differ in the contents of active agent from 81.8 to 87.3% (or more). Batches containing more of the active agent are toxic to rainbow trout if used in 2 or even 1 p.p.m. Treatment with PMA causes transitory irritation of gill lamellae in rainbow trout. Antidotes, if existing, could be tried with rainbow trout treated with PMA.

* Burrows, R. E.
1951. The treatment frequency and concentration necessary for adequate prophylaxis with pyridylmercuric acetate for the control of bacterial gill disease. Prog. Fish-Cult., Vol. 13, pp. 225-226.
Experiments on blueback salmon (Oncorhynchus nerka) in Foster-Lucas ponds. PMA is an effective prophylactic at 1 p.p.m. when given every two weeks if fish are not overcrowded. Weekly treatments at 1 p.p.m. or biweekly at 2 p.p.m. needed if there is more than 1 part of fish to 70 parts of water by weight. Temperature of water, rate of flow and oxygen concentrations were not taken under consideration.

* Burrows, R. E. and D. D. Palmer
1949. Pyridylmercuric acetate: Its toxicity to fish, efficacy in disease control and applicability to a simplified treatment technique. Prog. Fish-Cult., Vol. 11, pp. 147-151.
PMA is safe in use for the control of bacterial gill disease and some external protozoan parasites. It is more effective than Roccal. It should be used at 2 p.p.m. for 1 hour. Can be used in powder form or a stock solution. Non-toxic to all tested salmonid fishes. Toxicity of PMA to rainbow trout was described later in a paper by other authors. Detailed treatment method is given.

Davis, H. S.
1927. Further observations on the gill disease of trout. Trans. Am. Fish. Soc., Vol. 57, pp. 210-212.
A general description of several outbreaks which responded favorably to dips in copper sulphate 1:2,000.

* 1953. Culture and Diseases of Game Fishes. University of Calfornia Press, Berkeley, Cal. pp. 261-265.
Symptoms described in detail. Bacteria causing this disease belong to myxobacteria. Dietary gill disease is mentioned. Disease most common in hatchery

reared salmonid fishes, but present also in warm-water pond fishes. Treatments with copper sulfate and PMA are described.

Feustel, J. G.

1935. Gill disease checked. Prog. Fish. Cult., No. 6, pp. 7-8.

Potassium permanganate was used. Crystals were added to troughs at 5 p.p.m. Flow of water was not stopped. Treatments were repeated daily. Results apparently satisfactory but not convincing since there were no controls. A case history.

* Fish, F. F.

1935. A western type of bacterial gill disease. Trans. Am. Fish. Soc., Vol. 65, pp. 85-87.

A comparison between so called "eastern" gill disease apparently caused by specific bacteria and "western" gill disease which has the same symptoms but apparently different types of bacteria are present. Western type fails to respond to treatments with copper sulphate and potassium permanganate. Excellent photographs.

* 1938. Simplified methods for the prolonged treatment of fish diseases. Trans. Am. Fish. Soc., Vol. 68, pp. 178-187.

Description of a simple device for adding disinfectants to water at a constant rate. Discussion of the difficulties and limitations of prolonged treatments. Safe concentrations of potassium permanganate, copper sulphate, formalin, malachite green and other chemicals are listed in a table. Methods of treatment are out of date, but principles thoroughly discussed. Illustrated.

* 1947. A technique for controlling infectious disease in hatchery fish. Trans. Am. Fish. Soc., Vol. 74, pp. 209-222.

Treatment with Roccal introduced. Methods of calculations of the quantities of disinfectants as formalin and Roccal given in detail. Relationships between the weight of fish and volume of water in prolonged treatments. Use of ice blocks containing disinfectants. A list of external parasites which can be controlled with formalin is given. Out of bacterial diseases only gill disease responds to treatment with Roccal. Illustrations, calculation tables, and conversion facters are included.

* Rodgers, E. O., B. H. Hazen, S. B. Friddle and S. F. Snieszko

1951. The toxicity of pyridylmercuric acetate technical (PMA) to rainbow trout (Salmo gairdneri). Prog. Fish-Cult., Vol. 13, pp. 71-73.

Toxicity of PMA to rainbow trout. Relationship between the size of rainbow trout, temperature of water and the toxicity of PMA to rainbow trout. Lack of toxicity to brown and brook trout.

* Rucker, R. R.

1948. New compounds for the control of bacterial gill disease. Prog. Fish-Cult., Vol. 10, pp. 19-22.

Introduction of pyridylmercuric acetate for treatment of bacterial gill disease. Recommended concentration is 2 p.p.m. Roccal is not a uniform product; there are variations in toxicity to fish and efficacy in the control of gill disease between different types of Roccal. Blueback salmon (Oncorhynchus nerka) was used in experiments.

* Rucker, R. R., B. J. Earp and R. E. Burrows

1956. Lignasan for bacterial gill disease. Prog. Fish-Cult., Vol. 18, pp. 75-77.

Lignasan X is a disinfectant containing ethyl mercury phosphate as the active agent. It has been found effective in concentration of 2 p.p.m. in the control of bacterial gill disease. It is especially toxic to rainbow trout. It is less expensive than PMA. It is not effective for external protozoan parasites. Caution in its use is recommended.

* Rucker, R. R., H. E. Johnson and G. M. Kaydas
1952. An interim report on gill disease. Prog. Fish-Cult., Vol. 14, pp. 10-14.
This is a very valuable paper on bacterial and nutritional gill diseases. Literature is reviewed and new experiments described. Myxobacteria are found externally and in the tissues of fish with gill disease. Only external infections respond to treatment. Experimental introduction of bacterial gill disease failed. Experimental introduction of dietary gill disease was successful and the role of pantothenic acid was confirmed.

* Snieszko, S. F.
1949. Pyridylmercuric acetate technical: Its use in control of gill disease and some external parasitic infestations. Prog. Fish-Cult., Vol. 11, pp. 153-155.
Method of treatment with the use of a 10% stock solution of PMA is described.

* Wood, E. M. and W. T. Yasutake
1957. Histopathology of fish: V. Gill disease. Prog. Fish-Cult., Vol. 19, pp. 7-13.
Excellent review of the gill disease problem. Three types of gill diseases are described: bacterial, nutritional and hemorrhagic. Histopathology of all types is described and illustrated with photographs. Only the nutritional gill disease can be experimentally reproduced.

* Papers indicated by an asterisk are of special importance to fish culturists.

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